

1 SCISSORS FOR PIERCING AND CUTTING ANATOMICAL VESSELS
2

3 BACKGROUND OF THE INVENTION
4

5 1. Field of the Invention

6 This invention relates broadly to surgical
7 instruments. More particularly, this invention relates to
8 a scissors device for piercing and cutting vessels such as
9 blood vessels.
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11 2. State of the Art

12 During various surgical procedures, a portion of a
13 small vessel must be incised lengthwise. Such an incision
14 requires two steps. A standard scalpel is first used to
15 make a small hole in the anterior vessel wall, and then a
16 vascular scissors instrument 10 is used to make a
17 lengthwise cut starting at the small hole. Referring to
18 prior art Fig. 1, the scissors instrument 10 includes upper
19 and lower blades 12, 14 and a handle 14 operable to move
20 the blades relative to each other. The lower blade 14 of
21 the scissors is inserted through the small hole, and the
22 handle is operated to cause the blades to cut lengthwise
23 along the vessel to create an incision of the required
24 length. This two-step process is particularly delicate for

1 very small vessels, e.g., on the order of 2 mm in diameter
2 and smaller.

3

4 For example, incisions on small vessels are required
5 in various vascular, cardiac, ophthalmic, urethral, and
6 fallopian procedures. In each case, if during the initial
7 cut the scalpel is inadvertently pressed too far into the
8 vessel during creation of the incision entry, serious
9 damage can result to the posterior surface of the vessel as
10 well as the underlying tissue. In many cases, for example
11 during cardiac procedures, this damage can be very serious,
12 and even life threatening.

13

14 Microvascular scissors do have sharp points, but are
15 not designed small enough to pierce the vessel wall without
16 ripping it. In addition, the length and taper of the two
17 blades of the microvascular scissors are identical.
18 Therefore, as the lower blade is forced to pierce the
19 vessel, the tip of the upper blade invariably pierces or
20 rips the adjoining anterior portion of the vessel.
21 Further, the diameter of the lower blade in a microvascular
22 scissors widens dramatically thereby preventing travel into
23 the vessel lumen, especially if the vessel is of small

1 diameter (e.g., 2 mm to 4 mm), which is frequently the case
2 with coronary vessels.

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4 SUMMARY OF THE INVENTION

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6 It is therefore an object of the invention to provide
7 an instrument which facilitates making lengthwise incisions
8 on small vessels.

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10 It is another object of the invention to provide an
11 instrument which dramatically reduces the risk of
12 inadvertent damage to small vessels and the patient.

13

14 In accord with these objects, which will be discussed
15 in detail below, a surgical scissors instrument includes
16 upper and lower tissue cutting blades and a handle manually
17 operable to move one blade relative to the other between
18 open and closed positions in a scissoring action. The
19 upper blade preferably has a concave bow or is slightly
20 angled relative to the lower blade which causes the lower
21 surface of the upper blade and the upper surface of the
22 lower blade to contact each other as the handle is operated
23 and define a cutting interface.

24

1 In accord with the invention, one of the blades and
2 most preferably the lower blade is provided with a distally
3 projecting tip sufficiently sharp to relatively easily
4 pierce tissue. The tip is preferably a round body needle
5 or tear drop-shape cutting edge needle.

6

7 The blades and/or the tip may be permanently attached
8 to the scissors, may be removable and re-sharpened, may be
9 disposable and replaceable, and may be made from metal
10 and/or non-metal components. In addition, the blades may
11 be retractable.

12

13 When in a closed position, the upper and lower blades
14 are preferably angulated relative to the axis of the
15 handle, e.g., either at 30°, 45°, 60° or 90°. The handle,
16 whether metal or non-metal, permanent or disposable, may be
17 of any suitable type, such as Castroviejos type or a common
18 two ring handle. These cutting blades may also be coupled
19 to a long handle to allow manual or robotic thoracoscopic
20 or endoscopic use or on a catheter for percutaneous
21 application.

22

23 In use, the piercing tip on the lower blade is gently
24 pressed against a vessel, preferably at a shallow angle

1 relative to the vessel, to define an entry hole. This
2 shallow angle approach with the needle-like piercing tip
3 reduces the opportunity for inadvertent puncture. The
4 lower blade is then pushed further through the entry hole
5 in alignment with the piercing tip such that the cutting
6 blade portion of the lower blade also enters the vessel.
7 The handle is then operated to cause the upper blade to
8 rotate relative to the lower blade to cut the vessel tissue
9 therebetween to create the incision. If necessary, the
10 blades can be opened and moved to cut additional vessel
11 tissue.

12

13 The instrument of the invention facilitates making
14 lengthwise incisions in vessels by eliminating offline
15 cutting, and substantially reducing the likelihood of
16 cutting the posterior vessel wall. Furthermore, a
17 procedure that previously required two instruments and at
18 least two steps can now be performed more safely with a
19 single instrument and in a single step. In addition, the
20 instrument is particularly useful in both manual and
21 robotic procedures where the need to change instruments
22 during a procedure is reduced.

23

1 Additional objects and advantages of the invention
2 will become apparent to those skilled in the art upon
3 reference to the detailed description taken in conjunction
4 with the provided figures.

5

6 BRIEF DESCRIPTION OF THE DRAWINGS

7

8 Prior art Fig. 1 shows a scissors with a Castroviejos
9 handle of the type conventionally used in vascular surgery;

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11 Fig. 2 is a side elevation of a first embodiment of a
12 scissors of the invention;

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14 Fig. 3 is a side elevation of a second embodiment of a
15 scissors of the invention;

16

17 Fig. 4 is a broken side elevation of a third
18 embodiment of a scissors of the invention;

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20 Fig. 5 is a side elevation of a fourth embodiment of a
21 scissors of the invention; and

22

23 Fig. 6 is a side elevation of a fifth embodiment of a
24 scissors of the invention.

1
2 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

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4 Turning now to Fig. 2, a surgical scissors instrument
5 100 includes upper and lower tapering tissue cutting blades
6 110, 112 and a handle 114 manually operable to move one
7 blade relative to the other between open and closed
8 positions in a scissoring action. The handle 114 may be a
9 Castroviejos-type spring handle (as shown) or a well-known
10 ring handle (with rings or similar structure for fingers to
11 manipulate the handle).

12
13 The upper blade 110 is preferably relative planar
14 along its cutting surface. The lower blade 112 preferably
15 has a concave bow or is slightly angled relative to the
16 upper blade 110 which causes the upper surface 122 of the
17 lower blade 112 and the lower surface 120 of the upper
18 blade 110 to contact each other as the handle 114 is
19 operated so as to define a cutting interface.

20
21 In accord with the invention, one of the blades and
22 most preferably the lower blade 112 is provided with a
23 distally projecting tip 124 sufficiently sharp and long to
24 relatively easily pierce tissue. The tip 124 preferably

1 has a constant or suitable variable diameter over its
2 length. The tip 124 is preferably a round body needle or
3 needle having a triangular or tear-drop sectioned cutting
4 edge shape. The needle gauge is variable along its shaft,
5 depending upon the size of the vessel being opened.
6 However, the ground point of the needle is preferably a 25
7 or 26 gauge needle facilitating penetration of vessels of
8 the small size.

9

10 According to a first embodiment of the invention, the
11 lower blade 112 tapers or steps down to at least partially
12 define the tip 124 such that the upper blade 110 and the
13 tip when in a closed position terminate at substantially a
14 common location. The taper preferably, though optionally
15 not exclusively, occurs from a lower portion of blade 112
16 so that upper surface 122 of the lower blade 112 remains
17 straight and continuous along the entirety of the blade;
18 i.e., the cutting edge of the length of the lower blade
19 112, including tip 124, is identical to that of the upper
20 blade 110.

21

22 Turning now to Fig. 3, according to a second
23 embodiment of the invention, the upper and lower blades
24 110, 112a have shapes substantially similar to that of

1 prior art instruments. In accord with the invention, the
2 tip 124a extends from the distal end 126a of the lower
3 blade 112a, such that when the upper and lower blades 110,
4 112a are in a closed position, the tip extends further
5 therefrom. In the embodiment of Fig. 3, the tip 124a is
6 aligned with the lower surface 128a of the lower blade
7 112a. In the alternative, the tip 124a may extend in
8 alignment with the upper surface 122a of the lower blade,
9 or in some other direction.

10

11 Turning now to Fig. 4, according to a third
12 embodiment, which is substantially a combination of the
13 first and second embodiments, the cutting edge of the lower
14 blade 112b is continuous with the tip 124b, and the tip
15 extends from the distal end 126b of the lower blade 112b,
16 such that when the upper and lower blades 110, 112b are in
17 a closed position, the tip 124b extends further therefrom.
18 The tip 124b may be defined by a tapering of the lower
19 surface 128b of the lower blade. In addition, 130b
20 identifies a location for detachment of the lower blade
21 112b which, e.g., may be coupled to the remaining blade arm
22 132b via a friction fit or snap fit, permitting the use of
23 a disposable blade and tip.

24

1 When in a closed position, the upper and lower blades
2 are preferably angulated relative to the axis of the
3 handle, e.g., either at 30°, 45° (as shown), 60° or 90°.

4
5 The blades 110, 112 (referring hereinafter also to
6 112a and 112b) and/or the tip 124 (referring hereinafter
7 also to 124a and 124b) may be permanently attached to the
8 scissors 100, may be removable and re-sharpened, may be
9 disposable and replaceable, and may be made from metal
10 and/or non-metal components. The blades may also be
11 retractable.

12
13 In use, the piercing tip 124 on the lower blade 112 is
14 gently pressed against an anterior surface of a vessel,
15 preferably at a shallow angle relative to the vessel, to
16 define an entry hole. This shallow angle approach with the
17 needle-like piercing tip 124 reduces the opportunity for
18 inadvertent puncture. With the embodiment of Fig. 2, the
19 handle 114 is then operated to cause the upper blade 110 to
20 rotate relative to the lower blade 112 to cut the vessel
21 tissue therebetween to create the incision. With the
22 embodiments of Figs. 3 and 4, the lower blade 112a, 112b is
23 preferably advanced further through the entry hole in
24 alignment with the piercing tip 124a, 124b such that the

1 upper surface 122a, 122b of the cutting blade 112a, 112b
2 also enters the vessel. Then the handle 114 is operated to
3 cut the tissue. If necessary, the blades 110, 112 can be
4 opened and moved to cut additional vessel tissue.

5

6 Turning to Fig. 5, the cutting blades 210, 212 of the
7 invention may be coupled to the distal end 214 of a long
8 shaft 216 (flexible or rigid) and operated by manual
9 operation, e.g., via a handle 218 (other handles can be
10 used), or robotic operation, at a proximal end 220 of the
11 shaft. Apart from the blades 210, 212 of the invention,
12 such thoracoscopic or endoscopic scissors are well-known.
13 For example, U.S. Pat. No. 5,392,789, which is incorporated
14 by reference herein in its entirety, teaches an endoscopic
15 scissors. It is appreciated that in such an embodiment,
16 the blades 210, 212 are preferably in-line with the shaft
17 216.

18

19 Referring now to Fig. 6, the cutting blades 310, 312
20 of the invention may also be coupled to the distal end 314
21 of a catheter 316 or another similar flexible tubular
22 construct for percutaneous application. For example, U.S.
23 Pat. Nos. 5,817,013 and 6,352,503, which are incorporated
24 by reference herein in their entireties, teach scissors

1 blades coupled to the distal end of a flexible tubular
2 member.

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4 The instrument of the invention facilitates making
5 lengthwise incisions in vessels by eliminating offline
6 cutting, and substantially reducing the likelihood of
7 cutting the posterior vessel wall. Furthermore, a
8 procedure that previously required two instruments can now
9 be performed more safely with a single instrument.

10

11 There have been described and illustrated herein
12 embodiments of a surgical scissors and a method of using
13 the same. While particular embodiments of the invention
14 have been described, it is not intended that the invention
15 be limited thereto, as it is intended that the invention be
16 as broad in scope as the art will allow and that the
17 specification be read likewise. It will therefore be
18 appreciated by those skilled in the art that yet other
19 modifications could be made to the provided invention
20 without deviating from its spirit and scope as claimed.